GEOLOGY/GEOMORPHOLOGY

Physiographic Regions

Lower Subbasin

The lower subbasin lies within both Ozark Plateau (Salem Plateau subdivision) and the Mississippi Alluvial Plain (Missouri Department of Natural Resources (MDNR) 1986; Figure nd). The Mississippi Alluvial Plain region is commonly called "lowlands" because historically it was seasonally flooded. The Ozark portion of the subbasin (western and northern) is primarily forested, while the lowland portion (southern and eastern) is almost entirely in row crops. Elevations range from 890 feet National Geodetic Vertical Datum of 1929 (NGVD) in the McKenzie Creek watershed to 287 feet NGVD where the Black River exits Missouri.

Upper Subbasin

This subbasin lies within two subdivisions (St. Francois Mountain and the Salem Plateau) of the high relief Ozark Plateau (MDNR 1986). Land elevations range from 1,772 feet NGVD at Taum Sauk Mountain, the highest point in Missouri, to 494 feet NGVD at Clearwater Dam.

Geology

Lower Subbasin

The western and northern part of this subbasin lies in the Salem Plateau, which is formed on Cambrian and Ordovician carbonate rocks and topped by a thin layer of glacial loess (MDNR 1995; Figure ge). The southeastern part of the basin lies within the Mississippi Alluvial Plain, which is topped with a 150-foot Quaternary layer of unconsolidated gravel, sand, silt, and clay (MDNR 1995).

Upper Subbasin

The eastern part of the subbasin drains the St. Francois Mountains, which are formed on Precambrian igneous and Cambrian sedimentary rocks (MDNR 1995). Much of the Precambrian rock is weather-resistant rhyolite. Consequently, stream valleys are formed in the easily erodible Cambrian dolomite. The remaining basin drains the Salem Plateau, which is described above.

Soil Types

Lower Subbasin

Discussion of soil types in this subbasin is limited because soil surveys for Wayne County have not been completed. The soil types in northern and western sides of the subbasin are Loring-Captina-Clarksville

and Clarksville-Captina associations (United States Department of Agriculture (USDA) 1983). These soils are silty, moderately well drained, and suitable for trees. In low relief areas, these soils are suited for wheat and pasture. Maintaining fertility and overgrazing are management concerns. In high relief areas, soil erosion is a hazard.

In the Mississippi Alluvial Plain, Calhoun-Amagon and Tuckerman-Bosket associations dominate (USDA 1983) and drainage is considered poor. These soils are suited for soybeans, grain sorghum, wheat, rice, cotton, corn, vegetables, hay, and pasture. Maintaining soil fertility is the main management concern. Both of these soils are suitable for bottomland tree species (*e.g.*, bald cypress).

Upper Subbasin

Discussion of soil types is limited because the Reynolds County soil survey has not been completed. In the Salem Plateau, Goss-Viburnum and Clarksville-Wilderness associations dominate in the uplands and Delassus-Syenite associations dominate in the river valleys (USDA 1991). Goss and Clarksville soils are found on the sides of ridges and are well drained. Viburnum and Wilderness soils are located on the ridgetops. While Wilderness soils are well drained, Viburnum soils are poorly drained. The Goss-Viburnum soils are suited for either pasture or trees, while the remaining soils are best suited for trees. Both the Delassus and Syenite series are moderately well drained and best suited for northern red, white, and black oaks.

In the St. Francois Mountains, Irondale-Killarney-Knobtop associations dominate (USDA 1991). Irondale and Killarney soils are found on the side slopes and Knobtop soils are on the ridgetops. All of these soils are moderately well drained and unsuitable for row crops or pasture due to the hazard of erosion, droughts, and stones on the surface. All soils in this subbasin are considered highly erodible.

Watershed Area

The total drainage area for the basin is 1,756 square miles. The upper and lower subbasin are 906 and 850 square miles, respectively (Table 1).

Stream Order, Mileage, and Gradient

Lower Subbasin

A total of 1,856 miles of stream channel were identified, ordered, measured (by hand dividers), and classified as either intermittent or permanent as indicated on U.S. Geological Survey (USGS) 7.5 minute topographic maps (personal communication, Dennis Norman, Missouri Department of Conservation). There are 305 miles of stream 4th order (4⁰) or larger, including 86 miles of Black River (7⁰)(Table 2). The designation of 309 miles as permanent streams on the USGS topographic maps does not agree with the 163 miles of permanent stream classified under Missouri Water Quality Standards (MDNR 1996). The Missouri Water Quality Standards are probably more accurate because USGS topographic maps show many second and third streams as permanent, which disagrees with field

observations.

In this subbasin, 399 miles of the streams are channelized and 184 miles are levied, as determined from USGS 7.5 minute topographic maps. The majority of the channelization and floodplain alterations occur south of Poplar Bluff where the primary land use is agriculture.

Big Brushy and Cane Creeks are losing streams (MDNR 1986). Water from Cane Creek flows underground and resurfaces at Keener Springs on the Black River, which is five mile northeast (Vineyard 1982). It is unknown where the flow from Big Brushy Creek goes.

As expected, due to the physiographic makeup of the subbasin, the gradient of the Black River mainstem is much lower than in the upper subbasin. The highest gradient is 5 ft/mile near Piedmont and gradually decreases to 0.6 ft/mile at the state line. Gradients of tributary streams are higher on the western side of the subbasin (*e.g.*, Big Brushy and Tenmile Creeks). In the southern part of the subbasin, stream gradients are typically 1 ft/mile (*e.g.*, Black River and Main Ditch). Gradient plots for all fourth order and larger streams are on file at the MDC Southeast Regional Office.

Upper Subbasin

The Black River is a sixth order stream which is formed by the confluence of the West and Middle Forks of the Black River. The East Fork of the Black River enters the Black River approximately 1 mile downstream of this confluence. A total of 2,171 miles of stream channel were identified on USGS 7.5 minute topographic maps (personal communication, Dennis Norman, Missouri Department of Conservation). There are 310 miles of stream $\geq 4^0$ (Table 2). The designation of 327 miles of permanent streams on the USGS topographic maps does not agree with the 123 miles of permanent stream classified under Missouri Water Quality Standards (MDNR 1996). For reasons previously stated, the Missouri Water Quality Standards are probably a more accurate estimate.

Logan Creek, Doe Run Creek, and Sinking Creek are losing streams (MDNR 1986). Logan Creek loses most of its flow underground in a section where the stream incises an area of Gasconade dolomite. This groundwater then flows south to Blue Springs on the Current River (Vineyard 1982). It is unknown where the flows from Doe Run Creek and Sinking Creek go.

The average gradient for the Black River mainstem is 6 ft/mile, while the gradient in the East, Middle, and West Forks is 35, 25, and 19 ft/mile, respectively. In all three forks, gradients up to 200 ft/mile are present. Gradient plots for all fourth order and larger streams are on file at the MDC Southeast Regional Office.

Table 1. Drainage areas of major tributaries in the Black River basin.

Stream Name	Stream Order	Watershed Area (square miles)		
Lower Subbasin				
Black River	7	347		
Cane Creek	5	337		
East Ditch	6	166		
	Total =	850		
Upper Subbasin				
Black River	6	125		
East Fork Black River	5	95		
Middle Fork Black River	5	176		
West Fork Black River	5	165		
Sinking Creek	5	81		
Logan Creek	5	200		
Webb Creek	5	64		
	Total =	906		

Table 2. Major streams $(\ge 4^0)$ in the Black River basin. Tributary streams are indented.

Stream	Stream Order	Total Length (miles)		
Lower Subbasin				
Black River	7	86		
East Ditch	6	23		
Menorkenut Slough	5	15		
Unnamed Ditch	4	9		
Unnamed Ditch	4	9		
Cane Creek*	5	55		

Table 2 continued

Tenmile Creek	4	27
Black River Ditch*	5	14
Main Ditch	4	25
Indian Creek	4	12
Big Brushy Creek	4	21
Greenwood Valley Creek	4	9
	Total =	305
Upper Subbasin		
Black River	6	32
Webb Creek	5	11
N.F. Webb Creek	4	8
M.F. Webb Creek	4	8
Logan Creek	5	42
Dry Valley Creek	4	16
Sweet Water Creek	4	6
Sinking Creek	5	26
Harrison Valley Creek	4	6
Peola Branch	4	5
East Fork Black River	5	20
Taum Sauk Creek	4	8
Imboden Creek	4	9
Middle Fork Black River	5	25
Brushy Creek	4	15
Ottery Creek	4	10
Strother Creek	4	12
West Fork Black River	5	36
Bee Fork	4	15
Dee Fork	•	

 $[\]ensuremath{^*}$ - These streams join the Black River just south of the Missouri/Arkansas line.

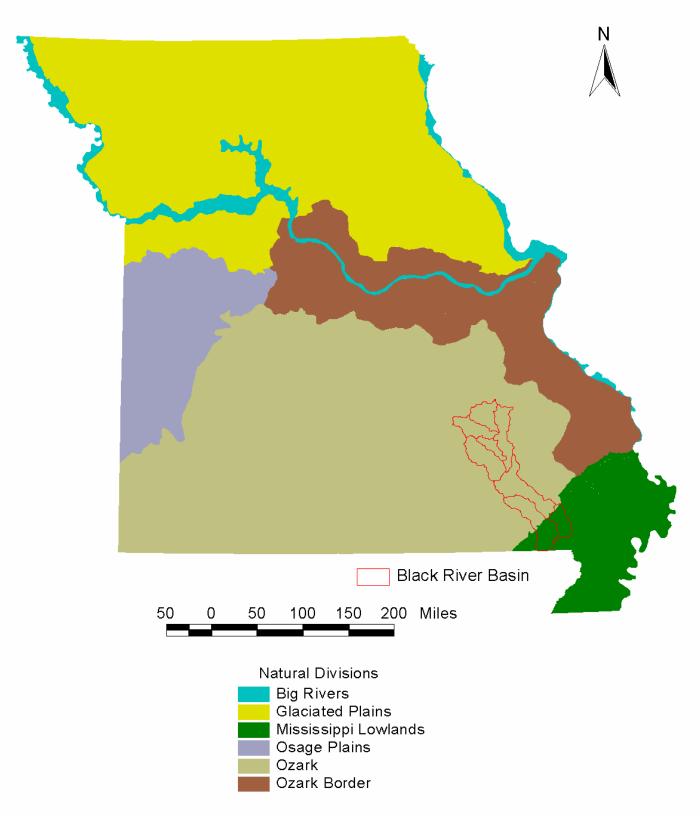


Figure nd. Location of the Black River Watershed within the natural divisions of Missouri.

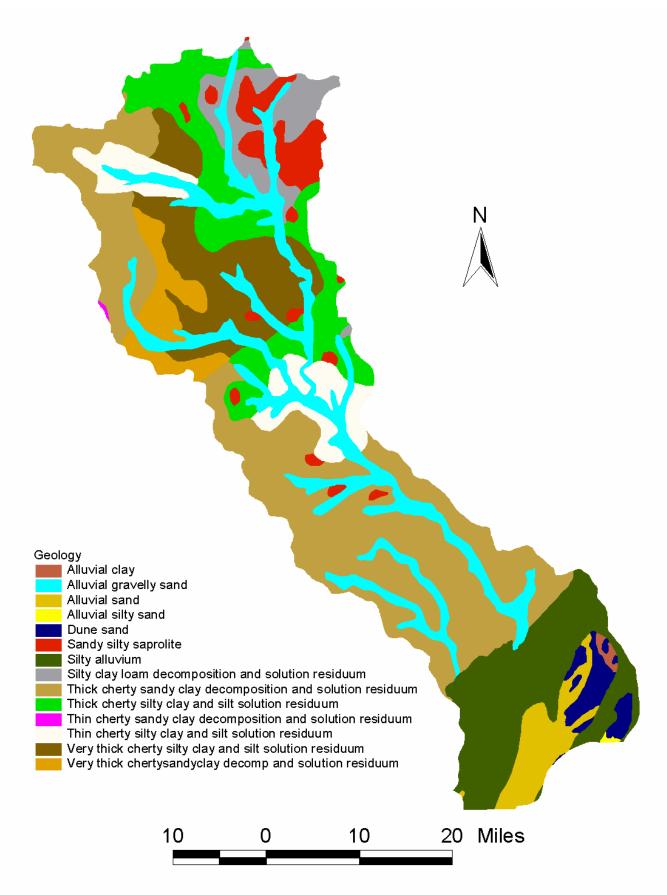


Figure ge. Geological formations in the Black River Watershed.